

The first rule of problem solving:

DON'T SOLVE PROBLEMS
BY CREATING PROBLEMS

OR AT LEAST
MAKE YOUR NEW PROBLEMS
AS SMALL AS POSSIBLE

23 air carrier accident reports of lap-held infants since 1970 indicated the following injuries would probably have been prevented by a child restraint system:

- 1972: one infant received minor injuries in turbulence
- 1984: one infant sustained serious injuries in a crash
- 1985: one infant received minor injuries in turbulence
- 1986: one infant received minor injuries in turbulence
- 1986: one infant received minor injury in a crash
- 1989: one infant dies of smoke inhalation after a crash
- 1990: one infant receives serious injuries in turbulence
- 1994: one infant receives fatal injuries in a crash
- HOWEVER, there are other kinds of airplanes ...





Chronological history of child restraint in aircraft

according to Dick Chandler

- 1959 - John Swearingen, CARI, proposes research in child restraint
 - center of gravity measurements of children
 - child flotation device
- 1964 - CARI includes child harness and bassinet systems in full-scale crash tests of L-1649 and DC-7 airplanes
- 1964 - FSF announcement: Airline employee develops seat belt for baby
- 1967 - SAE publishes ARP 776, Restraint Device for Small Children
- 1971 - FAA/OAM attempts to draft a TSO for child restraint system
- 1972 - CAMI tests infant seat, recommends that it be allowed for use in aircraft
- 1974 - More CAMI tests and draft specification for approving automobile CRS for use in aircraft
- 1974 - NHTSA proposed dynamic tests for evaluating child restraint systems for automobiles (revises proposal in 1978)

History, continued:

- 1975 - CAMI Memorandum Report describes dynamic tests and provides a draft specification for child seats that includes a dynamic test with a folding passenger seat back and an inversion test to simulate turbulence
- 1975 - FAA issues a regulatory interpretation that automobile child restraint systems are to be treated as baggage and cannot be used during takeoff and landing
- 1976 - AFS/Engineering Field Office begins development of a TSO for child restraint systems for aircraft that is based on the CAMI Memo Report
- 1978 - SAE ARP's upgraded in accordance with CAMI Memo Report
- 1978 - TSO completed but not included in regulatory agenda
- 1979 - NHTSA upgrades standard for automobile CRS to include dynamic tests
- 1979 - FAA Task force on Aircraft Child Restraint is formed

History, continued

- 1979 - FAA Task Force considers seven options:
 - Bulkhead mounted infant beds
 - Lap child restraint harness
 - Child restraint harness for passenger seats
 - Rear facing seats for children
 - Lock all passenger seat backs and use auto child seats
 - Specifically designed aircraft child seats
 - TSO to adapt 1979 NHTSA child restraint standard to accommodate aircraft environment
- 1979 - the last option was approved by the FAA Administrator
- 1980 - Draft TSO-C100 offered for comments. TSO would require child restraints used in aircraft to meet the NHTSA standard, plus a 44fps, 18g (min) test when installed in a passenger seat with free break-over seat back and held only by the lap belt, an inversion test for turbulence, and the traditional FAA static load requirements.



- 1981 - NHTSA objects to FAA TSO, wants FAA to accept seats that meet only NHTSA standards
- 1982 - FAA considers NHTSA objections and reduces dynamic test from 44 to 29 fps, issues TSO and permits use of approved CRS during landing and takeoff.
- 1983 - Child restraint designs representing 1.3 million in-service units certified under TSO
- 1983 - NHTSA (with NTSB support) renews objection to TSO. Secretary of DOT directs the Transportation Systems Center to recommend a resolution of the dispute.
- 1983 - TSC recommends NHTSA modify their standard to include the TSO requirements, and that FAA accept the revised standard. They estimate that between 0.006 and 0.68 lives will be saved per year.
- 1984 - NHTSA issues revised rule for child restraints in automobiles and aircraft, retaining only the inversion test of the TSO.
- 1985 - FAA issues guidance accepting seats complying with the NHTSA rule for use on board aircraft.

History, continued (but on a different track):

- 1983 - The General Aviation Safety Panel (GASP) begins working on recommendations for crashworthy (adult) seat and restraint systems for small private airplanes
- 1984 - GASP recommendations submitted to FAA. They include:
 - multi -axis dynamic tests of seat/restraint/occupant system
 - 42 fps, 26 or 21 g forward load
 - 42 fps, 19 or 15 g spinal load
 - seat deformation
 - pass/fail based on injury criteria as well as structural toughness
- 1985 - Joint FAA/AIA/ATA team formed to develop similar rules for adult seats in transport airplane.
 - Two dynamic tests of the seat/restraint/occupant system
 - 44 fps, 16 g forward load
 - 35 fps, 14 g spinal load
 - seat deformation
 - pass/fail based on injury criteria as well as structural toughness

History, continued (still on the different track):

- 1986 - Seat NPRM issued. Seat manufacturers announce availability of seats complying with the proposed requirements, and airframe manufacturers and air carriers order them
- 1988 - Regulations for improved adult seats and restraints in small private aircraft and in transport aircraft are issued
(Now, lets get back on track)
- 1988 to present - CAMI continues to evaluate automobile CRS, and identifies deficiencies in some CRS approved for use in aircraft when they are tested in accordance with the new aircraft requirements
- 1996 - FAA bans use of booster seats, harness and vest type of child restraints for use in aircraft
- 1997 - SAE issues ARP governing fit of CRS in passenger seats
- 1998 - NHTSA develops new requirement for Child Restraint Anchorage Systems in automobiles

Diversion ?

- Because of Cost
 - Cost might be 1 to 6 BILLION dollars over 10 years
 - additional cost might cause some families to travel by automobiles instead of airlines
 - automobiles are not as safe as airlines
 - the overall effect might be an increase in child injury
- Airlines are in business to make profit
 - Airlines aren't about to miss out on billions of dollars of profit over 10 years
 - families won't be diverted because that would cut profit
 - charges will be adjusted to keep the family business
- Anyway, travel by automobile is as safe as travel by airline (?)

Children weighing less than 40 pounds

- All 2 year old children
- 95% of 3 year old children
- 50% of 4 year old children
- 25% of 5 year old children
- 10% of 6 year old children
- 5% of 7 year old children
- 3% of 8 year old children
- < 1% of 9 year old children

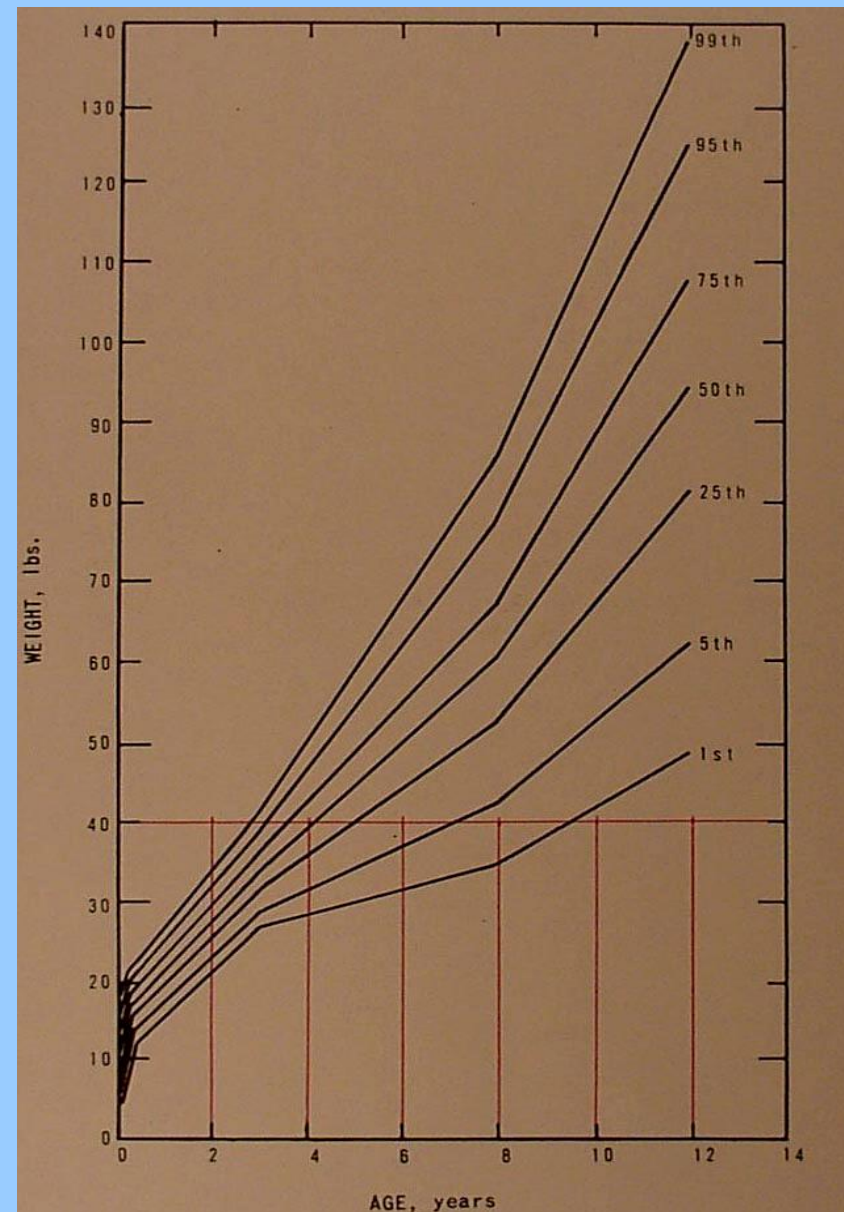


Fig. 1 - Percentile curves - children's body weight by ages

If the traveler must provide a CRS -

- Think of changing planes -
 - release your seat belt and collect your belongings, wait until you can get into the aisle, get into the aisle, walk down the narrow airplane aisle, up the boarding ramp, through the waiting area, find out the gate of your next flight, walk down the concourse, get on the moving sidewalk, get off the moving sidewalk, walk to the next moving sidewalk, get on the next moving sidewalk, get off the next moving sidewalk, walk to the escalator, get on the down escalator, get off the down escalator, walk over to the subway entry, rush into the subway car, hold on, rush out of the subway car, walk to the up escalator, get on the up escalator, get off the up escalator, walk down the concourse, get on the moving sidewalk, get off the moving sidewalk, walk to the next moving sidewalk, get on the next moving sidewalk, get off the next moving sidewalk, walk to the waiting area, wait(?), walk down the boarding ramp, walk down the narrow airplane aisle, find your seat, stow your belongings, get seated, fasten your seat belt.
- Now, think of all the families with children changing planes, and carrying CRS(s) in addition to all the other stuff they must carry
- Now, think of all the parents who will write their Congressman about that hassle

If the airline must provide the CRS -

- How many and what kind of CRS must be available?
- Redistribution of add-on CRS after use
- Who puts the add-on CRS on/off the airplane?(Passenger, ground crew, cabin crew? When the travelers change planes?)
- Who is responsible for proper use of the CRS? (Passenger or cabin crew?)
- Who is responsible for injuries associated with use of the CRS? (misuse or unfamiliarity in an emergency)
- Sanitation and maintenance of the CRS
- How about children with special needs?
- Etc., etc., etc.

Maybe we need a different approach. Consider:

1. Aircraft are not automobiles.
2. There are other ways, besides the automobile CRS, to provide good protection against injury in an aircraft crash or turbulence.
3. A mandate that all occupants be restrained in an aircraft need not mandate the use of automobile CRS.
4. If we do mandate that all occupants be restrained in an aircraft, we should continue to allow parents to use their CRS.
5. Then, if they bring the CRS, they can be seated wherever the CRS is allowed.

6. If parents don't bring CRS for their children, they would all be seated in the rear of the aircraft in rear-facing adult passenger seats.

This approach has several advantages:

- it is simple and would work
- child restraints in rear facing adult seats don't carry high crash loads. The cushioned seat back will do the job, and distribute the load in an optimum manner. A baby belly belt might even be enough for positioning the child and for turbulence.
- those parents and children would (typically) be near a lavatory, floor level emergency exits, and possibly a galley, for their convenience
- with many airlines, they would board first, and have more time to get settled

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